

**WHAT IS CLAIMED:**

1. A method of detecting a target nucleic acid or protein, comprising:
- (a) providing a target comprising a nucleic acid or protein and a first member of a binding pair;
  - (b) hybridizing the target nucleic acid or protein to a probe attached to a hydrogel matrix through a 2 + 2 photocycloaddition;
  - (c) contacting the first member of the binding pair with a second member of the binding pair, said second member comprising a fluorophore; and
  - (d) detecting the fluorophore.
2. The method of claim 1, wherein the first member comprises a first member selected from the group consisting of biotin, digoxigenin, and bromouridine.
3. The method of claim 2, wherein the first member comprises biotin.
4. The method of claim 1, wherein the second member is selected from the group consisting of avidin, streptavidin, biotin antibody, digoxigenin antibody, and bromouridine antibody.
5. The method of claim 4, wherein the second member comprises streptavidin.
6. The method of claim 1, wherein the nucleic acid is synthesized by producing a cDNA from a mRNA.

7. The method of claim 1, wherein the nucleic acid is synthesized by producing a cDNA or a cRNA from a DNA.
8. The method of claim 1, wherein the target is synthesized by incorporating the first member of a binding pair into the nucleic acid by polymerization.
9. The method of claim 1, wherein the protein is from a cell lysate.
10. The method of claim 1, wherein the hydrogel matrix comprises polyacrylamide.
11. The method of claim 1, wherein the hydrogel matrix comprises polyurethane.
12. The method of claim 1, wherein the probe comprises a reactive site capable of undergoing a 2 + 2 photocycloaddition.
13. The method of claim 1, wherein the hydrogel matrix comprises a reactive site capable of undergoing a 2 + 2 photocycloaddition.
14. The method of claim 5, wherein the streptavidin is attached to one or more fluorophores.
15. The method of claim 14, wherein the streptavidin is attached to between three and four fluorophores.

16. The method of claim 1, wherein said fluorophore is selected from the group consisting of cyanine dyes and ALEXA FLUOR dyes.

17. The method of claim 16, wherein the cyanine dye is Cy-3, Cy-5, or Cy-5.5.

18. The method of claim 16, wherein the ALEXA FLUOR dye is ALEXA-532, ALEXA-647, or ALEXA-633.

19. The method of claim 1, wherein said fluorophore is ALEXA-647.

20. The method of claim 1, further comprising contacting at least one of the second members of the binding pair with an antibody comprising a first member.

21. The method of claim 20, wherein the antibody is a biotinylated anti-streptavidin antibody.

22. The method of claim 20, wherein the first member comprises biotin and the second member comprises streptavidin attached to more than one fluorophore.

- ~~23.~~ A kit for detecting a target nucleic acid or protein, comprising:
- (a) a hydrogel matrix;
  - (b) a probe capable of hybridizing a target, wherein said probe is attached to said hydrogel matrix by a 2 + 2 photocycloaddition;
  - (c) a first member of a binding pair capable of being attached to a nucleic acid or protein to form a target; and

- (d) a second member of the binding pair capable of binding the first member of the binding pair; said second member comprising a fluorophore.

24. The kit of claim 23, further comprising probe standards and target standards.

25. The kit of claim 23, wherein the first member is selected from the group consisting of biotin, digoxigenin, and bromouridine.

26. The kit of claim 23, wherein the first member comprises biotin.

27. The kit of claim 23, wherein the second member is selected from the group consisting of avidin, streptavidin, biotin antibody, digoxigenin antibody, and bromouridine antibody.

28. The kit of claim 27, wherein the second member comprises streptavidin.

29. The kit of claim 23, wherein the hydrogel matrix comprises polyacrylamide.

30. The kit of claim 23, wherein the hydrogel matrix comprises polyurethane.

31. The kit of claim 23, wherein the probe comprises a reactive site capable of undergoing a 2 + 2 photocycloaddition.

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32. The kit of claim 23, wherein the hydrogel matrix comprises a reactive site capable of undergoing a 2 + 2 photocycloaddition.
33. The kit of claim 23, wherein the nucleic acid comprises a cDNA or a cRNA.
34. The kit of claim 23, wherein the protein is from a cell lysate.
35. The kit of claim 28, wherein the streptavidin is attached to more than one fluorophore.
36. The kit of claim 35, wherein the streptavidin is attached to between three and four fluorophores.
37. The kit of claim 23, wherein the fluorophore is Cy-3, Cy-5, or Cy-5.5.
38. The kit of claim 23, wherein the fluorophore is ALEXA-532, ALEXA-647, or ALEXA-633.
39. The kit of claim 23, wherein the fluorophore is ALEXA-647.
40. The kit of claim 23, further comprising an antibody that binds to the second member of the binding pair.
41. The kit of claim 40, wherein the antibody comprises a first member of the binding pair.

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42. The kit of claim 41, wherein the antibody comprises a biotinylated anti-streptavidin antibody.

~~43.~~ A method of detecting a single nucleotide polymorphism, comprising:

- (a) hybridizing a target nucleic acid to a probe attached to a hydrogel matrix through a 2 + 2 photocycloaddition, said probe designed to terminate at the site of the single nucleotide polymorphism;
- (b) extending the probe by one nucleotide, wherein the nucleotide comprises a first member of a binding pair;
- (c) contacting the first member of the binding pair with a second member of the binding pair comprising a fluorophore; and
- (d) detecting the fluorophore.

44. The method of claim 43, wherein the nucleotide is a dideoxynucleotide or an acyclonucleotide.

45. The method of claim 43, wherein the nucleotide comprises the first member of the binding pair before said nucleotide is incorporated into the probe.

46. The method of claim 43, wherein the first member of the binding pair is attached to the nucleotide after incorporation of the nucleotide into the probe.

47. The method of claim 43, wherein the first member of the binding pair comprises biotin.

48. The method of claim 46, wherein the second member of the binding pair comprises streptavidin.

49. The method of claim 43, wherein the hydrogel matrix comprises polyacrylamide or polyurethane.

50. The method of claim 1, wherein the probe comprises a reactive site capable of undergoing a 2 + 2 photocycloaddition.

51. The method of claim 48, wherein the streptavidin is attached to more than one fluorophore.

52. The method of claim 43, wherein said fluorophore is selected from the group consisting of cyanine dyes and ALEXA FLUOR dyes.

53. The method of claim 52, wherein the cyanine dye is Cy-3, Cy-5, or Cy-5.5.

54. The method of claim 52, wherein the ALEXA FLUOR dye is ALEXA-532, ALEXA-647, or ALEXA-633.

55. The method of claim 43, wherein said fluorophore is ALEXA-647.

56. The method of claim 43, further comprising contacting at least one of the second members of the binding pair with an antibody comprising a first member.

57. The method of claim 56, wherein the antibody is a biotinylated anti-streptavidin antibody.

58. The method of claim 56, wherein the first member comprises biotin and the second member comprises streptavidin attached to more than one fluorophore.

- ~~59.~~ A kit for detecting a single nucleotide polymorphism, comprising:
- (a) a probe attached to a hydrogel matrix through a 2 + 2 photocycloaddition, wherein said probe is designed to terminate at the site of a single nucleotide polymorphism;
  - (b) a nucleotide comprising a first member of a binding pair, wherein said nucleotide is designed to extend the probe by one nucleotide;
  - (c) a second member of the binding pair comprising a fluorophore, wherein said second member binds to the first member.

60. The kit of claim 59, wherein the nucleotide is a dideoxynucleotide or an acyclonucleotide.

61. The kit of claim 59, wherein the nucleotide comprises the first member of the binding pair before said nucleotide is incorporated into the probe.

62. The kit of claim 59, wherein the first member of the binding pair is attached to the nucleotide after incorporation of the nucleotide into the probe.



63. The kit of claim 59, wherein the first member of the binding pair comprises biotin.

64. The kit of claim 59, wherein the second member of the binding pair comprises streptavidin attached to more than one fluorophore.

65. The kit of claim 59, wherein the hydrogel matrix comprises polyacrylamide or polyurethane.

66. The kit of claim 59, wherein the fluorophore is selected from the group comprising ALEXA FLUOR and cyanine dyes.

67. The kit of claim 59, wherein said fluorophore is ALEXA-647.

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